

WHAT IS CLAIMED IS:

1. An *in vivo* rodent model for testing a compound in locally targeted odontogenic organ and associated periodontal tissues, comprising a mandibular incisor and a window in an alveolar bone overlying the incisor's apex or along radicular surface of the incisor.
2. The model of claim 1, wherein said rodent is selected from the group consisting of rat, rabbit, mouse, hamster, guinea pig, squirrel and beaver.
3. The model of claim 1, wherein said window is further adapted to receive an osmotic pump for delivery of said tested compound.
4. A drug screening for a potential bone disease therapy compound, which comprises the steps of:
 - a) administering said compound to the model of claim 1;
 - b) determining histological and histomorphometric parameters of alveolar bone of the model's incisor and comparing to a normal incisor; wherein increase in anabolic activities or decrease in catabolic activities are indicative of a potential bone disease therapy compound.
5. The drug screening of claim 4, wherein said bone disease is osteoporosis.
6. A drug screening for a compound inducing tissue repair, which comprises the steps of:
 - a) administering said compound to the model of claim 1;
 - b) determining histological and histomorphometric

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parameters of alveolar bone and other tissues of the model's incisor and comparing to a normal incisor; wherein increase in anabolic activities or decrease in catabolic activities are indicative of a compound inducing tissue repair.

7. The drug screening of claim 6, wherein said compound is a growth factor or a combination thereof.

8. A drug screening for a potential anti-cancer therapy compound, which comprises the steps of:

- a) administering said potential anti-cancer therapy compound to the model of claim 1,
- b) determining eruption rate of the model's incisor and comparing to normal eruption rate of an incisor; wherein a decrease in growth rate is indicative of a potential anti-cancer therapy compound in controlling cell division.

9. A test to determine the role of extracellular matrix molecules, which comprises the steps of:

- a) administering to the model of claim 1 using a minipump drugs that affect secretion and postranslational modifications of said extracellular matrix molecules and/or antibodies or antagonists thereof;
- b) determining histological and histomorphometric parameters of alveolar bone and other tissues of the model's incisor and comparing to a normal incisor; wherein cell organization and behavior, extracellular matrix organization, and degree of mineral deposition are indicative of a drug interfering with said extracellular matrix molecules.

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10. A test for the immune response, which comprises the steps of:
- a) administering selected pathogens to the model of claim 1 using a minipump;
 - b) determining growth profile of pathogen, tissue alterations, inflammatory cell infiltration are indicative of a pathogen inducing an immune response.
11. A test for toxicity of a biomaterial and components thereof, which comprises the steps of:
- a) administering concentrations of a biomaterial or components thereof to the model of claim 1 using a minipump;
 - b) determining cell death, cell division and matrix production of the bone and tooth of the model's incisor and comparing to a normal incisor; wherein increase in anabolic activities or decrease in catabolic activities are indicative of a toxic biomaterial or components thereof.
12. A test for the efficiency of genetic material transfer, which comprises the steps of:
- a) administering an expression construct which encodes for a marker gene and/or a gene of interest to the model of claim 1 using a minipump;
 - b) determining expression of said marker to assess efficiency of said expression construct to transduce the tooth organ and associated tissues.
13. A method of gene therapy, which comprises the steps of:
- a) administering an expression construct which encodes for a gene of interest to the model of

- claim 1 using a minipump;
- b) inducing or repressing expression of a gene product of said gene.

14. A method of producing a non-human mammal *in situ* knock-out model, whose stem cells and somatic cells in targeted odontogenic organ and associated periodontal tissues are modified to express at least one gene or an allelic variant of said gene which comprises introducing an expression construct which encodes for a gene of interest or a deletion of said gene to the model of claim 1 using a minipump into the mammal.

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